GEOLOGY AND PALÆONTOLOGY.

THE WHITE RIVER BEDS OF SWIFT CURRENT RIVER, NORTH-WEST TERRITORY.—Dr. Geo. M. Dawson, of the Geological Survey of the Dominion of Canada, Dr. Alfred Selwyn, director, has sent me for identification a number of fragments of mammalian skeletons from the above locality for determination. They embrace ten species, which are the following: Rodentia, *Palæolagus turgidus* Cope; Creodonta, *Hemipsalodon grandis*, gen. et sp. nov.; Perissodactyla, *Menodus* sp., *Menodus* sp., *Anchitherium* sp. indet., *Aceratherium mite* Cope, *Aceratherium pumilum* sp. nov.; Artiodactyla, *Entelodon mortoni* Leidy, ? *Leptomeryx mammifer* sp. nov.; Carnivora, ? *Dinictis* sp.

Of the above the most remarkable is the Creodont, *Hemipsalodon grandis*. The new genus belongs to the Oxyænidæ,[1] and is the first one of that family that has been found in beds higher than the Bridger Eocene. The species is the largest of the Creodonta, and the jaw from which it is known is more robust than that of any existing carnivore. Its dimensions are about those of the *Achænodon insolens* of the Bridger beds. The genus Hemipsalodon differs from the others of the family in the presence in the lower jaw of the full dental series of four premolars and three true molars without diastema behind the canine. Incisors three. The only crown perfectly preserved is the last true molar. It is of the type of Oxyæna, but probably has no internal tubercle (specimen worn at the point). It has a heel more or less cutting. The species is characterized by the deep compressed form of the ramus, and the long symphysis. The incisor teeth are crowded, and the canine tooth is of enormous size, and is directed upwards. The premolars are all two-rooted, except the first. The fourth is longer than the first true molar. The true molars increase in size posteriorly. The third is very robust, and has elevated cusps, the median exceeding the anterior. The sectorial edges are very steep, forming together a V. The heel is quite short, and has a cutting keel which is the summit of the external face, and is nearly median. The coronoid process rises at a very short distance posterior to it. The masseteric fossa does not extend downwards to the inferior edge of the ramus. The latter is not inflected on the inner side as far posterior as below the middle of the coronoid process, where it is broken off.

Length of dental series, M. .212; of true molars .085; of premolars .108; diameters of last true molar: anteroposterior .034, transverse .021; do. of canine at base: anteroposterior .040, transverse .029. Depth of ramus at M.3, .086; length of symphysis .131.—*E. D. Cope.*

OCCURRENCE OF BOULDERS OF DECOMPOSITION AT WASHINGTON, D. C., AND ELSEWHERE.—In the literature of surface geology surprisingly little is said of "boulders of decomposition." This

[1] See NATURALIST, 1884, p. 480.

probably arises from the fact that such are seldom seen *in situ* north of the southern limit of the drift, having been removed from their places of origin during the ice age. It may not be uninteresting to those geologists whose studies are in the field of surface deposits to know of a convenient locality where such boulders are even in the process of being made, as doubtless very many of the erratics, especially those of larger size, were thus produced before their subsequent transportation, as pointed out by Dr. Sterry Hunt and others.

At several localities in the District of Columbia, boulders of various sizes can be seen, which to the superficial observer may be taken for drift masses, as in my own case upon earlier visits to the region. During June, 1884, whilst driving with Mr. W. J. McGee (U. S. Geol. Surv.) past a hillside just outside of Georgetown, along the Potomac river, I observed perfectly rounded boulders of gneiss in a large mass of decayed rock of similar composition. Subsequently, accompanied by Mr. George P. Merrill (National Museum), we more thoroughly examined them. The hillside has been partly cut away in the construction of the road beside the river, and thus the decayed crystalline rocks are exposed for a depth of forty or fifty feet or more. Much of the gneiss rock is disintegrated, but contains unaltered masses which have resisted the atmospheric decay. The rock is often poor in feldspar. In some places it is hornblendic. Some of the gneiss upon weathering exhibits a schistose structure, yet much is remarkably compact, but traversed by numerous jointed planes, extending in all directions. As the weathering proceeds from the jointed planes it leaves solid masses of every possible shape, from those with only the more exposed upper solid angles rounded off, through various forms where all the angles are removed, but with flat sides remaining, representing the original joint planes, to masses which are almost perfectly spheroidal, though often showing a banded structure. Internally some of the smaller boulders are more or less decayed, others are perfectly compact, but in digging them out there may be seen surrounding them concentric zones, marking not concretionary structure but the progress of decay. These coatings may be removed like the coats of an onion. Each zone is defined more or less sharply, sometimes with comparatively little gradation from the last decomposed layer to the resulting solid interior which forms the boulder.

Upon the sloping top of the hills there are large sized boulders; with their angles and faces more or less rounded, and although standing two, three or four feet above the grass-covered soil of decomposed gneiss, yet their under portions, upon examination, are found to be connected with the solid masses beneath. Thus we find in every stage of production excellent examples of the genesis of large "boulders of decomposition"—boulders not distinguishable from very many of those which have been trans-

ported great distances during the Pleistocene period. There are several localities in the District of Columbia where such boulders may be seen, but their development cannot be studied so well as in the artificial cuttings in the hillsides along the Potomac river.

Having made a study of these large boulders in a state of formation, one, who is familiar with Northern erratics, is led to agree with Dr. Sterry Hunt, that at least the larger "rounded masses of crystalline rocks, left in the process of decay, constitute the boulders of the drift," and not only these but many *roches moutonnées.*

This deduction has been objected to upon the ground that boulders generally do not continue to enfoliate.

In the District of Columbia many of the boulders seen out of the hillsides described, do not show continued exfoliation (naturally very slow and with the atmospheric forces removing such as rapidly as formed, where not protected) any more than many erratics, while others are more or less uniformly decayed throughout the whole mass.

Although very many erratics do not show regular exfoliation, yet there are numbers of places where exfoliating boulders may be found in the drift. Perhaps there are no better localities for studying these rocks than those I examined during the last two summers, in the greater drift deposits along the Mississippi river, at Burlington, Keokuk, Warsaw and elsewhere. At these places numerous northern boulders—mostly greenstones—may be found of various sizes from a few pounds to a few thousand, which are now exfoliating and in various stages of decay, having forms from subangular to spheroidal. Also near the southern limit of the drift, at Columbia, Mo., situated upon the highlands, away from the river valleys, similar examples may be found, both of greenstone and gneissoid rocks.

Neither the presence nor absence of ice scratches affect the above explanation of the primary origin of these large boulders, but only represent subsequent abrasion, or the absence of that action, or else the more recent surface decay of the rocks themselves.—*J. W. Spencer, M.A., Ph.D., F.G.S.*

ARE THERE ANY FOSSIL ALGÆ?—Mr. Lester F. Ward, in a paper read before the American Association at Philadelphia gave some statistics of the fossil flora of the globe. Among other things he said that from the Lower Silurian there have been described species of Algæ. The question arises, what are the probabilities of Algæ being preserved in a fossil state?

It seems to have been the habit of geologists, almost from the time that palæontology assumed the aspect of a science, to refer to "fucoids" or Algæ many fossil markings which were evidently not *animal* remains. It was assumed that everything fossil must have been an organism, and it is only of late years

that the fact has been admitted that many of these fucoids are in reality inorganic.

Let any one consider for a moment the structure of the most of the species of modern Algæ; remember how easy it is for cellular tissue to be destroyed by only a short immersion in water, and the unreasonableness of expecting to find fossil Algæ will be perceived. Or again, let anyone turn, as Professor Lesquereux, for one, has done, to modern sea beaches; let him see the immense masses of kelp thrown up by the waves of every storm, and see how soon they disappear by passing "into gelatinous, half-fluid matter, which penetrates the sand" (Lesq.), and he will again see how unreasonable it is to say Algæ can be long preserved. Even when covered with sand, mud or clay they disappear and leave no trace behind them.

Professor Hall, in the first two volumes of the Palæontology of New York, enumerates thirty-six species and varieties of these fucoids from the Trenton, Hudson River and Clinton groups. He recognizes the fact that many trails, burrows and possible water marks are preserved in the rocks, but has no hesitation in referring many fossil marks to undoubted Algæ. Later writers have not been behind in naming and describing other species. In 1878 fourteen new ones were added as found in the rocks of the Cincinnati group. Recent investigations of these fourteen, and of some eighteen others reported from this group, have revealed the fact that *not a single one* is an undoubted Algæ, *all* can be referred either to water marks, trails, tracks or burrows of different sorts, or to graptolites.

This statement can be proved only by comparison with marks found on recent beaches and mud flats. Sir Charles Lyell has shown how leaves, impressions of bird tracks, mud cracks, worm borings and rain-drop impressions can be and are preserved on the mud flats of the Bay of Fundy. There is no reason for supposing that circumstances were less favorable during the continuance of the Silurian epoch in geological time. The writer of this has studied many recent mud marks, and has seen in process of formation tracks and burrows which resemble, to an astonishing degree these fossil marks.

For instance, the burrows made by a species of beetle in the mud wonderfully resemble some of the fossils, *Palæophycus rugosus*, for example. The trickling of water down a sloping bank leaves traces like those which, fossil, have been called Algæ. The dashing of rain on the surface of mud leaves marks which have been compared to the roots of plants. Impressions left on mud by fragments of organisms have been described as fossil Algæ, even when not the remotest resemblance could be noted between them and any modern prototype.

Professor Nathorst, in a memoir written in Swedish[1] and pub-

[1]Om spar af nagra Evertebrerade djur M. M. ochderas Paleontologsika Betydelse.

lished in Stockholm in 1881, enters a vigorous protest against the indiscriminate identification of fossil marks with Algæ. In this memoir he tells how certain of these marks were readily made by himself, and how many others can be identified with marks seen on ocean beaches.[1] It is, indeed, time that this habit of referring to some sort of life every mark found in the rocks of the earth, and calling all uncertain marks marine plants, should be protested against. If it is not done the nomenclature of the science will be so encumbered with useless names that chaos will result. The multiplication of species has gone entirely too far already; and when every mark made by a dash of water, every turn made by a worm or shell, and every print left by the claw of a crustacean is described as a new addition to science, it is time to call a halt and eliminate some of the old before making any more new species.—*Jos. F. James.*

GEOLOGICAL NEWS.—*Jurassic.*—The Marquis of Saporta announced to the geological section of the French Association for the Advancement of Science, the discovery of a plant bed of Jurassic age near Beaune. The enclosing rock is a fine-grained limestone, probably of the Corallian epoch. The plants are closely related to those which have been collected from beds of the same age upon the Meuse, and consist of attenuated conifers and dwarf cycads and ferns. The discovery at two points so far apart of such a starveling flora proves that it was not local, as at first believed, but was spread over a large area. Associated with these plants are some widely-spread echini, such as *Cidaris cervicalis*, *C. florigemma*, etc. M. Saporta has also returned to the defense of bilobites, gyrolites and other fossils, the vegetable origin of which has recently been disputed.——The Cretaceous of the Pyrenees has been studied by M. Hebert, who published the first part of his researches in 1867, and in a more recent article states that nothing has since come to hand to invalidate his previous conclusions respecting the Lower Cretaceous, which are to the effect that the Lower Neocomian is wanting, the Middle Neocomian is continuous, the Upper Neocomian occurs at many points, and is lacking in others through denudation, and that the Gault exists both in the Central Pyrenees and the Corbières. The Lower Cretaceous usually abuts upon faults which bring it in contact with beds which are proved by their fauna to be Senonian, and therefore much more recent. The Lower Cenomanian appears to be absent from this region, while the Upper Cenomanian lies either upon the Neocomian or the Trias, thus showing that at the time when the chalk of Rouen was deposited the Pyrenees had in great part emerged, forming an island or a series of islets in a Cenomanian sea. The Turonian is largely represented in the Pyrenees, but the almost crystalline structure of the beds is unfavora ble to palæontological researches.

[1] The Count Saporta has shown, in reply to Mr. Nathorst, that some of the reported Algæ are correctly so determined.—ED.

Tertiary.—Sr. Lotti (Boll. Com. Geol. d'Italia, 1884) gives a summary of his investigations into the age and structure of the granites of Elba and the surrounding districts. These granites show two principal types, granite and quartzose porphyry; the latter traverses and is involved with the sedimentary rocks of the Apennines in such a way that geologists have been compelled to pronounce it Eocene. As it is against the usual idea to refer granites to so recent an epoch, an effort has been made to find a separation between the granite and the quartzose porphyry into which it passes. This Sr. Lotti declares to be thoroughly inadmissible, and at direct issue with the facts. The feldspathic rocks graduate from a normal or tourmaliferous granite to a quartzose porphyry through varieties with or without tourmaline, but the Pre-silurian gneissic schists of the eastern part of the Elba show a gradual passage toward granite, and are traversed by granite seams. Sr. Lotti concludes that not only are the porphyry, granite and intermediate varieties of the same age, but that all were formed at the expense of the gneissic schists in the Eocene epoch, while the Eocene strata were contorted and dislocated, and fragments embedded in the erupted mass.

Quaternary.—M. A. Favre has presented the Paris Academy of Sciences with a map of the ancient glaciers of the northern slope of the Swiss Alps and of the chain of Mt. Blanc. This map indicates the development of the glaciers, and, so far as the scale permits, shows also the glacial deposits, erratic blocks, and moraines. Besides showing the direction and extension of the seven principal glaciers, M. Favre demonstrates how, on taking the height of an erratic block above the neighboring valley, it is possible to know what was formerly the thickness of the ice over that point, and also how the slope of the surface of the ancient glacier can be determined. In this way he has determined thicknesses of 1181, 1220 and 1235 meters. The author particularly insists upon the extension of the glacier of the Rhone, which at certain points reaches a height of 1650 meters, and for a length of 149 kilometers and a width of 45 was almost horizontal. The moraines of these old glaciers are numerous. Many are composed of clayey or marly deposits with striated pebbles and blocks of greater or less size, while others are almost entirely formed of blocks of crystalline rocks. Examples of the latter occur at Combloux and Césarege, in the valleys of the Arve, Rhone, etc. Here are blocks which contain from 700 to even 2000 cubic meters.

BOTANY.[1]

THE FERTILIZATION OF PHYSOSTEGIA VIRGINIANA.—In marked contrast with the imperfectly proterandrous almost synacmic *Brunella vulgaris* is the closely related Physostegia. The pro-

[1] Edited by PROF. C. E. BESSEY, Lincoln, Nebraska.